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ON AN EPIDEMIC OF SORE THROAT AND THE VIRULENCE OF STREPTOCOCCI ISOLATED FROM THE MILK *

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The occurrence of virulent streptococci in milk and the relation of infected milk to epidemics of "septic sore throat" are now generally recognized. The object of this paper is not so much to report an epidemic of this character, which was recognized as such from a study of the cultural and other characteristics of the streptococci isolated from the patients' throats and sputum, as to detail the peculiar pathogenic powers of the streptococci from the infected milk.

The epidemic occurred during February, 1914, in Elmhurst, Illinois, a city of 3,800 people. The infections, as compared with the usual epidemics of sore throat, were less severe, and the organisms isolated were of a moderate grade of virulence, being distinctly less virulent than the strains of streptococci isolated from the throats in cases of the milk-borne epidemic of sore throat occurring in Chicago in the winter of 1911-12, and studied by Capps and Miller,[1] Davis,[2] and Rosenow.[3] In some cases, the initial infection of "sore throat" was followed by bronchopneumonia, and attacks of "rheumatic" myositis and arthritis. Investigation showed that some thirty cases had occurred in families using milk from one dairy. Dr. Langhorst, of the board of health in Elmhurst, co-operated with us in securing cultures from the cases, and the owners of the dairy supplied us with samples of milk from the various farms, eight in all.

The streptococci isolated from the throats produced on blood agar plates rather large, moist colonies, surrounded by narrow, ill-defined, hazy zones of hemolysis, corresponding closely in these characteristics with the organisms isolated from the milk, and indistinguishable from the milk organisms after animal passage. The method of isolating the organisms from the milk was as follows: Seven-ounce samples of

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[1] Jour. Am. Med. Assn., 1912, 58, p. 1848.
[2] Ibid., p. 773; p. 1852.
[3] Jour. Infect. Dis., 1912, 11, p. 338.

milk were centrifugated at high speed for twenty minutes. The sediment obtained was streaked on the surface of blood agar plates and inoculated into tubes of ascites dextrose broth. Hemolyzing streptococci, similar to those obtained from the throat cultures, were obtained in nine of eleven samples so treated; four of these were virulent for guinea-pigs, producing a fatal peritonitis when injected intraperitoneally.

On the strength of these findings, the health officials required that for a time pasteurized milk only should be sold in Elmhurst. Promptly upon compliance with this order, the epidemic subsided.

Observations on the pathogenicity of Strains 6 and 8, two virulent strains from the milk, will serve to illustrate the results obtained.

Cultures, grown twenty-four hours in ascites dextrose broth, were injected intravenously into healthy, half-grown rabbits. Rabbits 1 and 3 received large inoculations (the growth from 45 c.c. of the broth cultures suspended in 3 c.c. NaCl solution) of Strains 6 and 8, respectively, and Rabbits 2 and 4 received small inoculations (10 c.c.). Both Rabbits 1 and 3 died within one-half hour, apparently from acute intoxication. The bodies were incubated two hours and then cultures were made of the joint fluids of both rabbits. Rabbit 1 gave large numbers of the inoculated organisms in pure culture; Rabbit 3 gave negative results.

Rabbit 2, which received the small inoculation of Strain 6, died in six days. Examination showed polyarthritis, involving each of the legs and three of the lower dorsal vertebrae, also a myocarditis and myositis. The muscles of the chest and shoulders were thickly studded with fine, slender, elongated lesions running parallel with the muscle fibers. These on microscopic examination showed masses of streptococci. The organisms were recovered in pure culture from these lesions and from the blood. A similar result followed upon re-inoculation.

Rabbit 4, inoculated with Strain 8 at the same time and under the same conditions as Rabbit 3, developed symptoms of arthritis. It died on the eighth day following inoculation. The peritoneal surfaces were congested and the peritoneal fluid increased in amount. The gall-bladder was distended and showed numerous whitish patches about 0.5 mm. in diameter. The other organs showed no changes. Cultures from the blood, joints, pericardiac and peritoneal fluids gave negative results. Cultures from the bile gave numerous colonies of a pure culture of the streptococcus inoculated. Sections of the gall-bladder showed numerous small areas entirely denuded of epithelial lining. Cultures of Strain 8, as recovered from the gall-bladder in Rabbit 4, were again inoculated into rabbits. It now caused death in eight days, the rabbit showing marked congestion of the liver and acute peritonitis. The peritoneal fluid contained a pure culture of the organism in large numbers, the blood a few, while the other body fluids were sterile. One rabbit had, in addition to this, a slight pericarditis with increase of pericardiac fluid, and one, a bronchopneumonia of the right lung.

The point of special interest in these experiments is the fact that two strains of streptococci isolated from the milk, indistinguishable from each other as to form and cultural characteristics, were nevertheless quite different, as shown by intravenous injection into animals, one localizing in the muscles and joints, and the other in the gall bladder. It is significant that the strain which produced arthritis was found in large numbers in the joint in one of the rabbits which died one-half hour after injection of the large dose, while the strain which failed to produce arthritis was proved to be absent in the joints in the other animal that died one-half hour after injection.

SUMMARY

An epidemic of streptococcal sore throat, traced to an infected milk supply, subsided when pasteurization of the milk was instituted.

Virulent streptococci isolated from the milk showed selective preference for certain animal structures, such as joints, muscles, gall-bladder, etc., as had the streptococci previously observed by Rosenow[4] in strains isolated from articular and muscular rheumatism in man, and in certain "laboratory" strains after they had acquired a certain grade of virulence. Furthermore, the organisms from milk resembled the rheumatic strains culturally and morphologically. Involvement of muscles and joints occurred in patients who were infected by the milk. These observations strongly suggest that infected milk, in addition to causing epidemics of sore throat, in which the symptoms are acute and marked, may be the source of streptococci of such virulence as to cause rheumatism and allied conditions in human beings.

[4] Jour. Infect. Dis., 1914, 14, p. 61.